

Hurricane Forecast Improvement Program | NOAA

Testing of the GFS EnKF for 2010's tropical cyclones

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This year's EnKF

- Data assimilation: 80-member T254L64 using 2010 GFS on ESRL's tjet, vs. last year's 60-member T382L64 using 2009 GFS on NSF's TACC.
- Ensemble forecasts: 20 members to 5 days lead
- T574L64 and T254L64 control from ens mean also
- Bug fixes, mid-August 2010:
 - Assimilate more hyperspectral data (AIRS and IASI) ; last year's we mistakenly used only lowest ~1000 channels.
 - Fixed scan-angle bias correction bug for satellite radiances; wasn't updating bias.

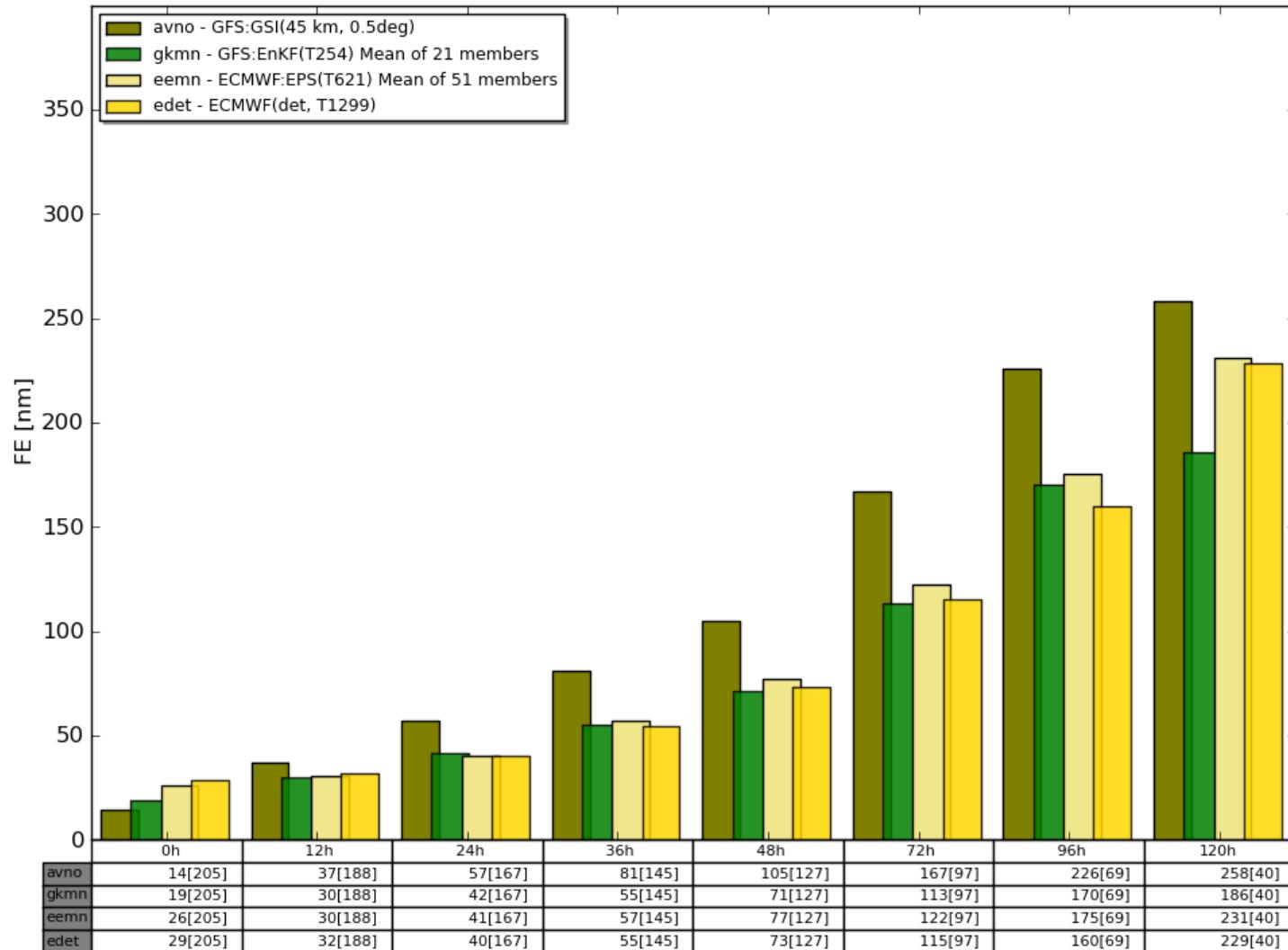
Ongoing EnKF development

- **Development of EnKF/Var hybrid for operational implementation at NCEP/EMC (THORPEX funding);** testing T254 ensemble to modify background error covariances for T574 GSI (& eventual 4D-Var); Whitaker and NCEP/EMC's Daryl Kleist, Dave Parrish, John Derber, OU's Xuguang Wang
- Quantifying observation/representativeness errors for TCVitals minimum SLP data (informed by Ryan Torn's work).
- Assimilating TCVitals minimum SLP separately as position / intensity data, rather than treating it as any other SLP observation (again, Ryan Torn, Chun-Chieh Wu, Chen/Snyder etc have tested this previously).
 - parallel tests being conducted right now.
- New graphical displays (Paula McCaslin's Google Map tracker; Hamill's fitted ellipses on spaghetti plots; stamp maps).
- Test assimilation of eye dropsondes (no results yet).

Global stats (as of 16 Sep) c/o Fiorino

NHEM through 2010091600

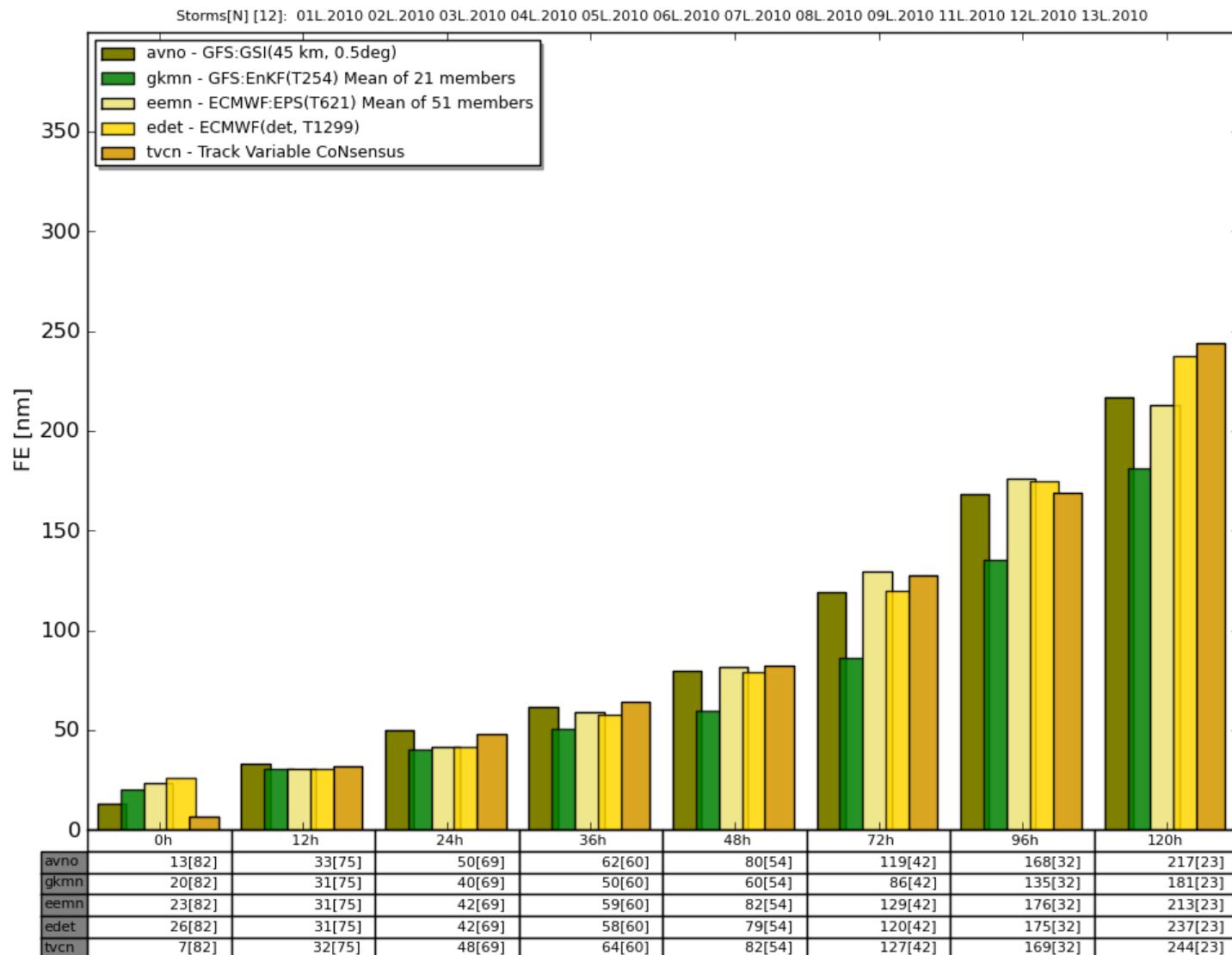
[N] [32]: 01L.2010 02E.2010 02L.2010 03E.2010 03L.2010 03W.2010 04E.2010 04L.2010 04W.2010 05E.2010 ... 09L.2010 09W.2010 10E.2010 10W.2010 11E.2010 11L.2010 11W.2010 12L



GFS/EnKF competitive with ECMWF ensemble mean and their deterministic forecast. AVN deterministic much worse.

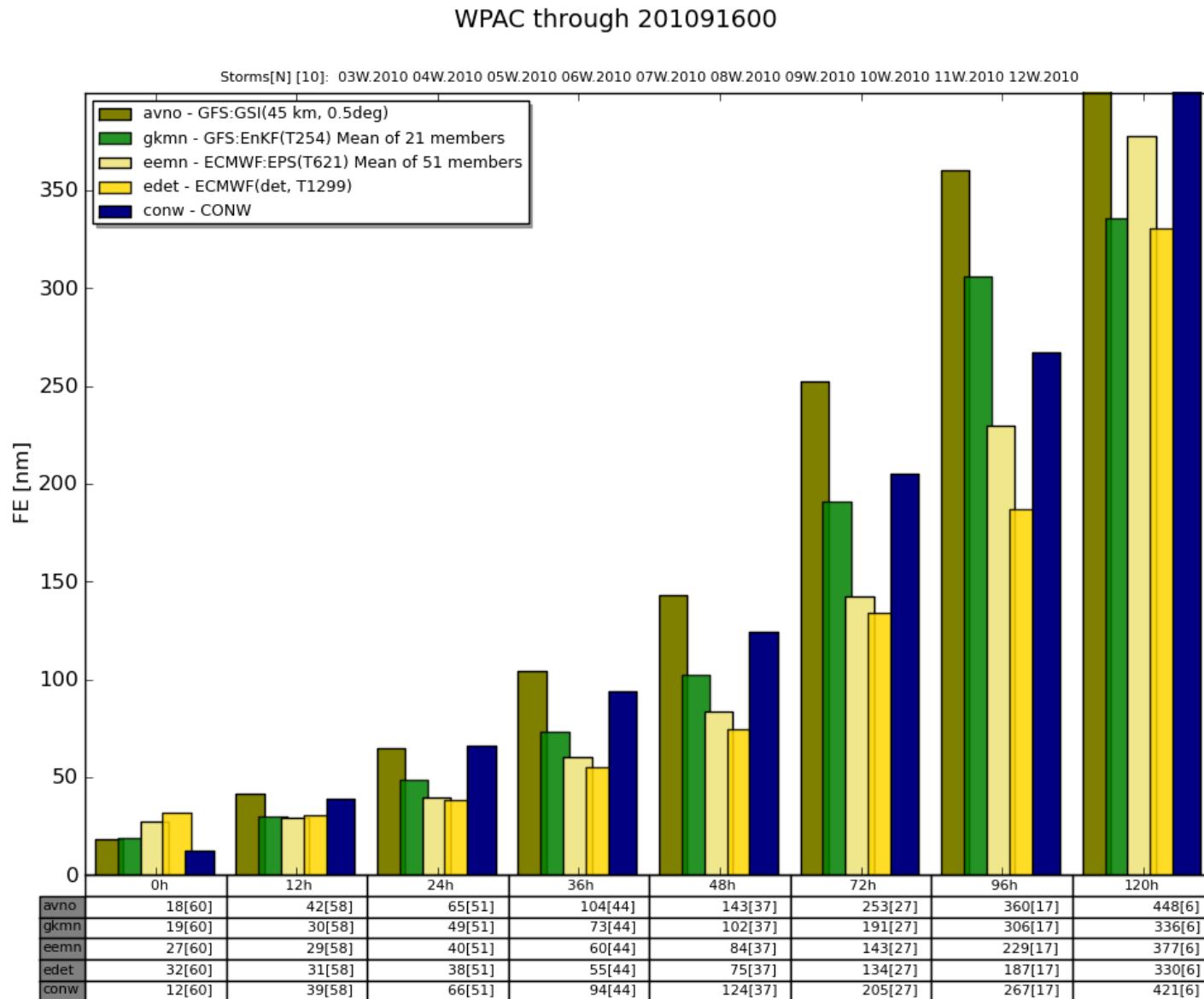
Atlantic stats (as of 16 Sep) c/o Fiorino

LANT through 201091600



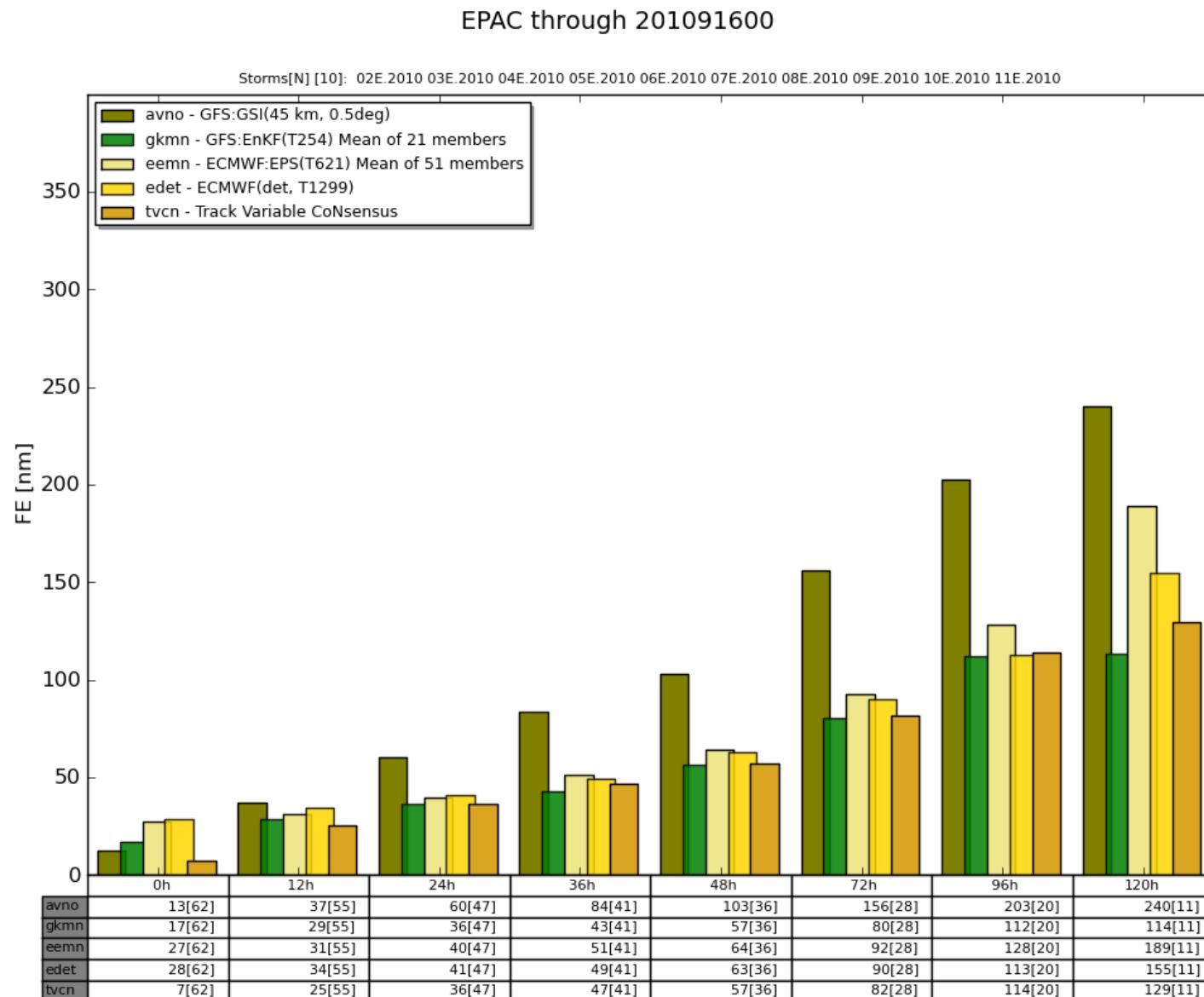
GFS/EnKF
lower
than
ECMWF
after
~36 h.

West Pac stats (as of 16 Sep) c/o Fiorino



ECMWF
deterministic
and ensemble
ahead of
GFS/EnKF;
AVN worse.

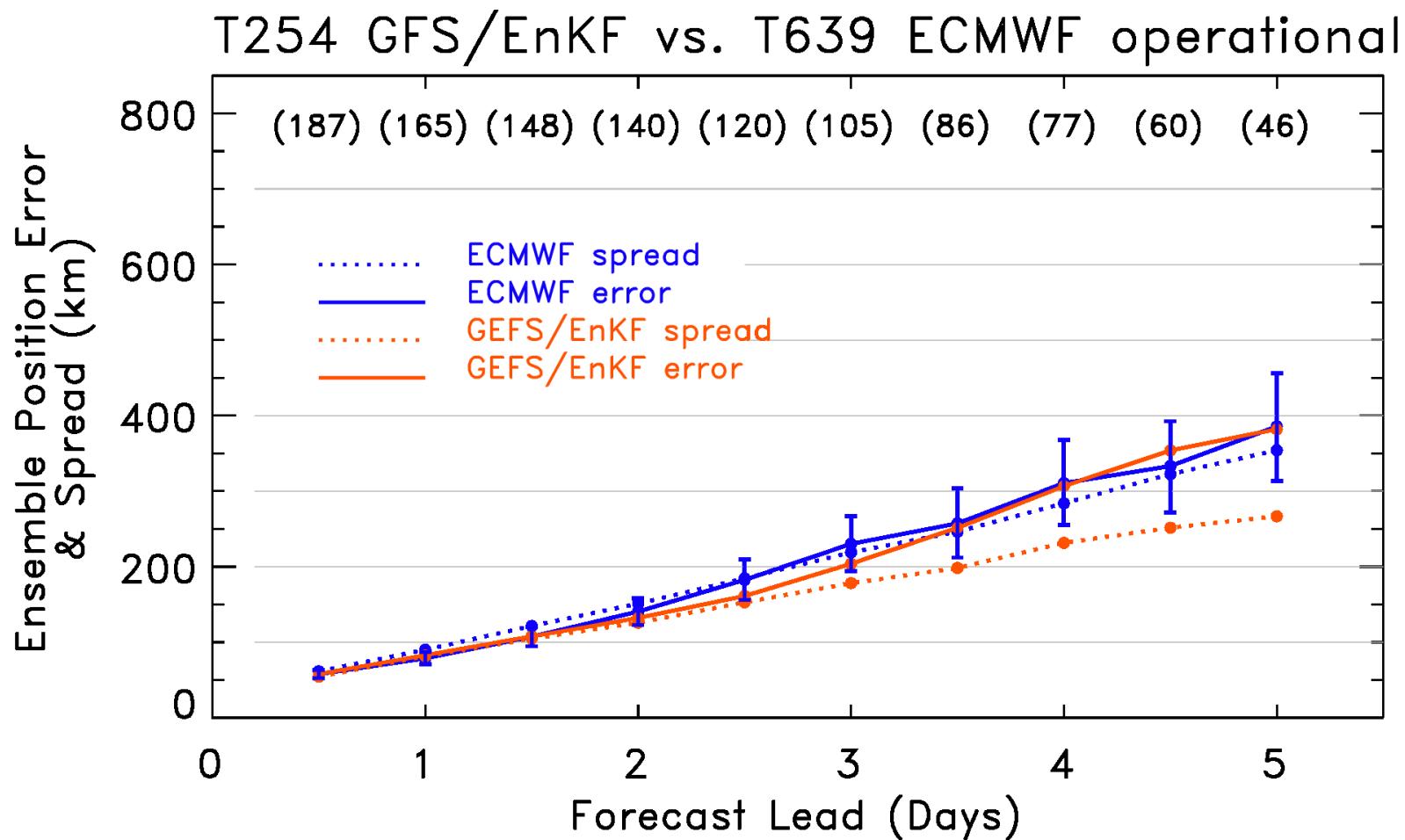
East Pac stats (as of 16 Sep) c/o Fiorino



GFS/EnKF
competitive
with or
ahead of
ECMWF

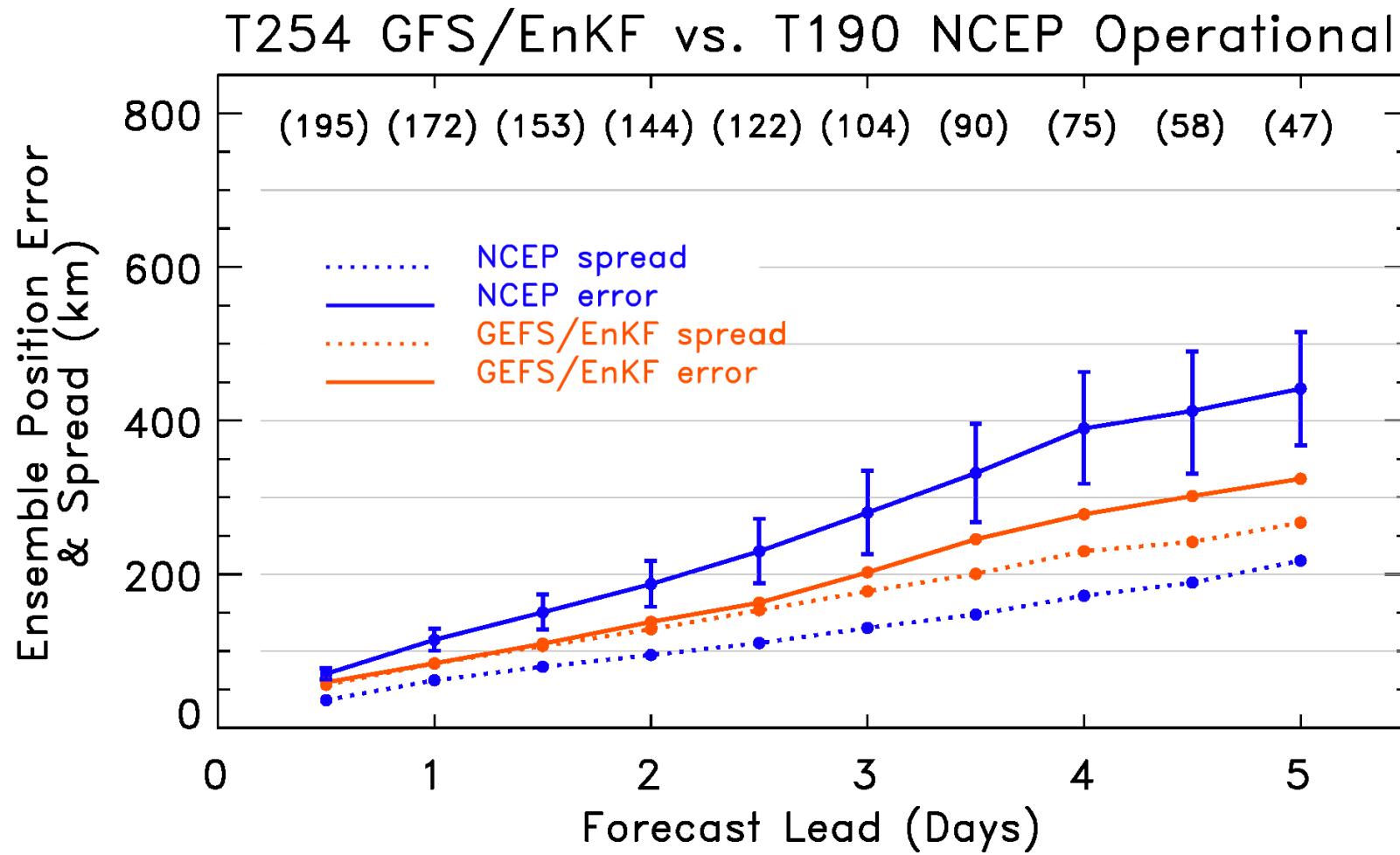
Global statistics, GFS/EnKF vs. ECMWF

(ensemble statistics, 5 June to 21 Sep 2010; all basins together)



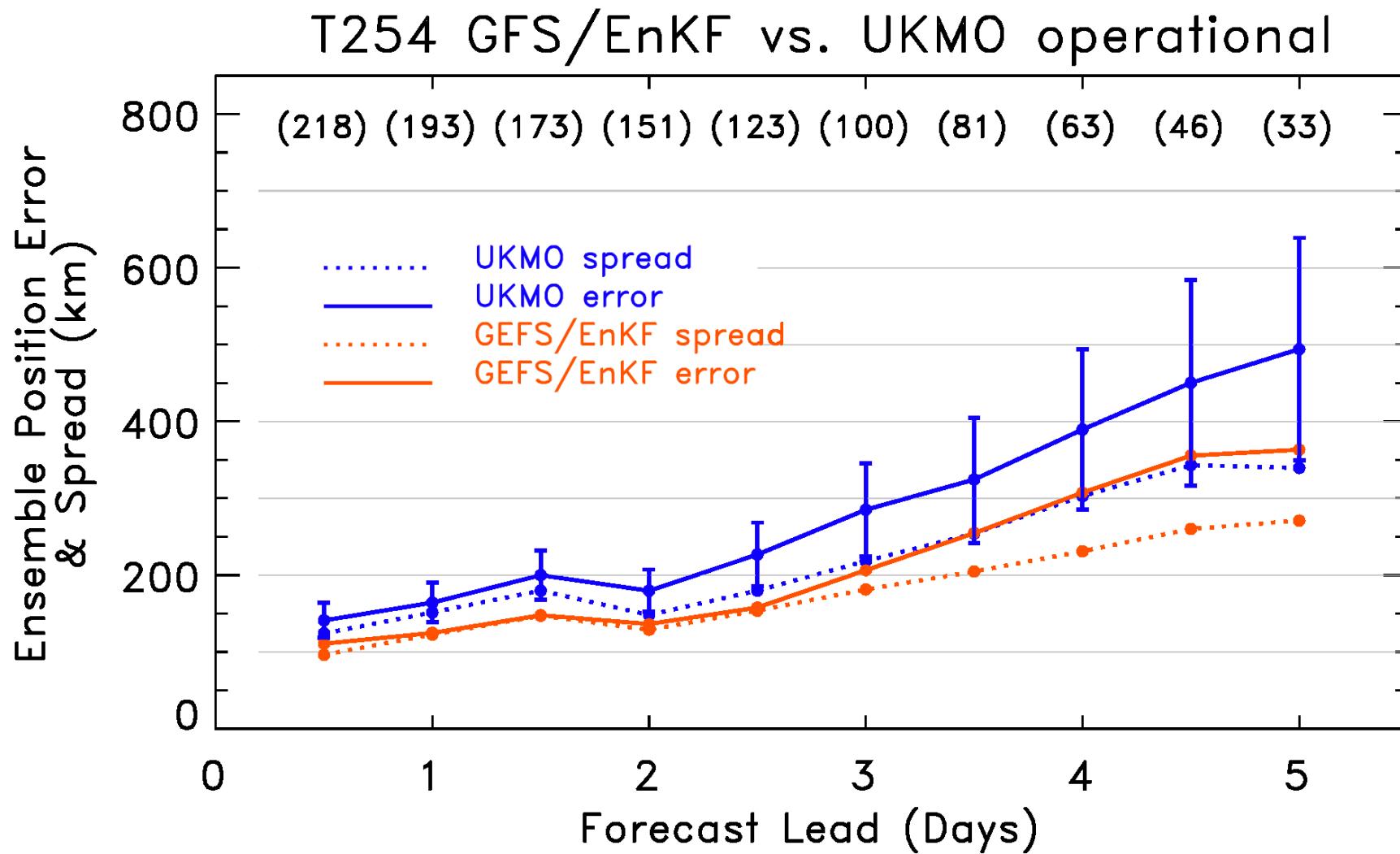
GFS/EnKF competitive despite lower resolution (T254 vs. ECMWF's T639). GFS/EnKF has less spread than error this year, more similar last year. Is this due to this year's T254 vs. last year's T382?

Global statistics, GFS/EnKF vs. NCEP



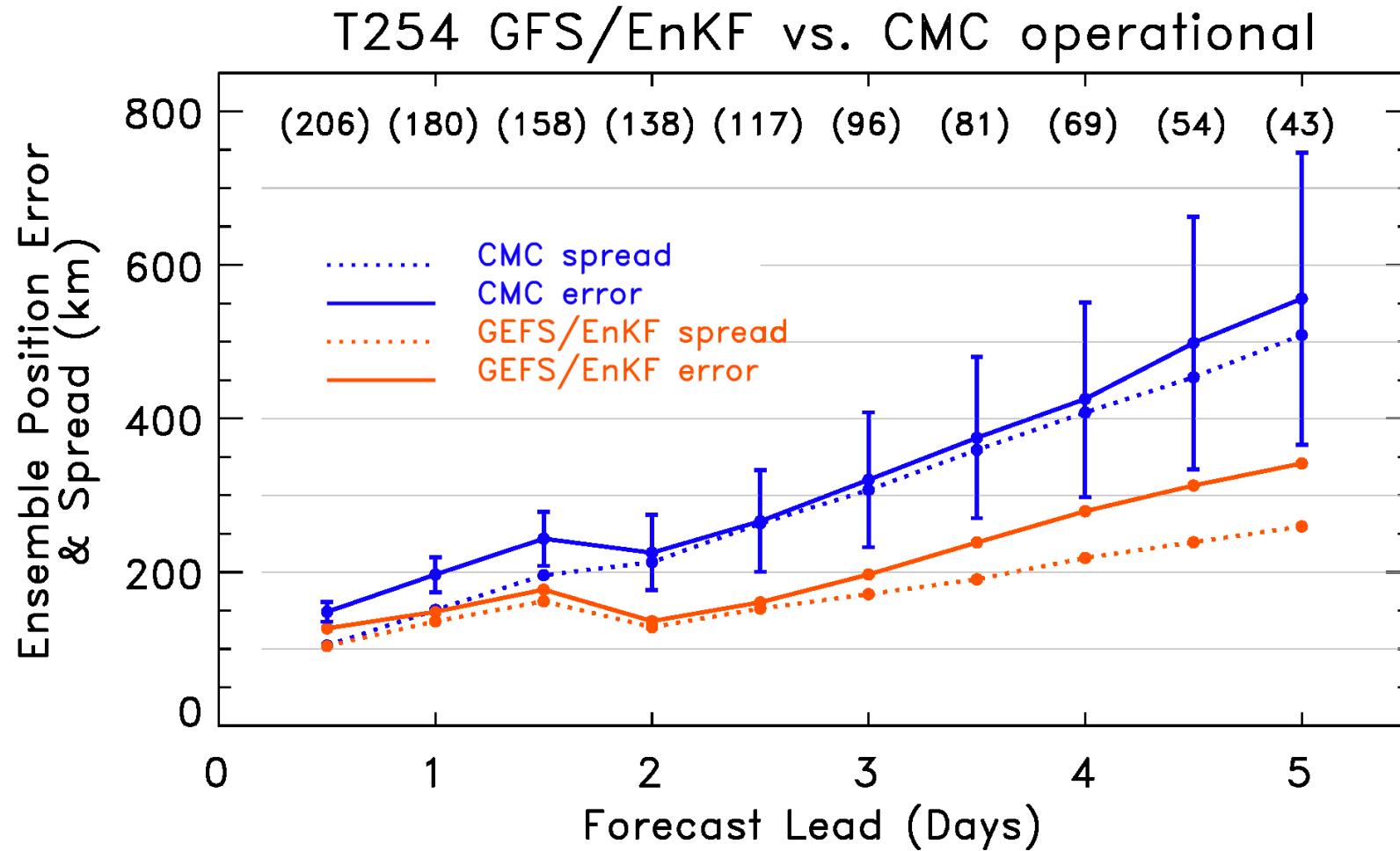
At most every lead, GFS/EnKF is statistically significantly better than NCEP operational ens., which uses (a) older GFS model, lower resolution; (b) ETR perturbations around GSI control, and (c) vortex relocation.

Global statistics, GFS/EnKF vs. UKMO



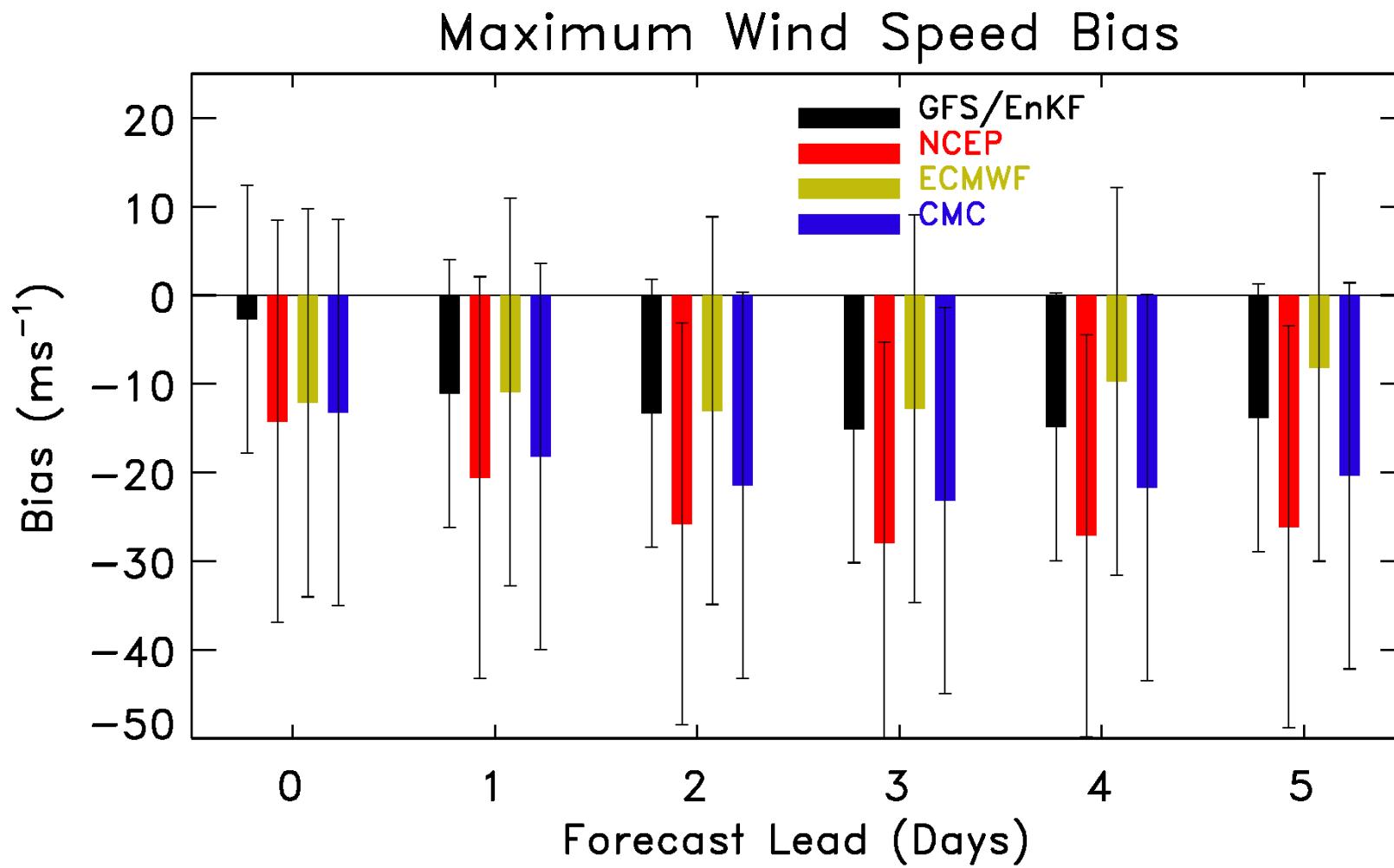
Again, improvement is mostly statistically significant, outside 5/95 block bootstrap CI's.

Global statistics, GFS/EnKF vs. CMC

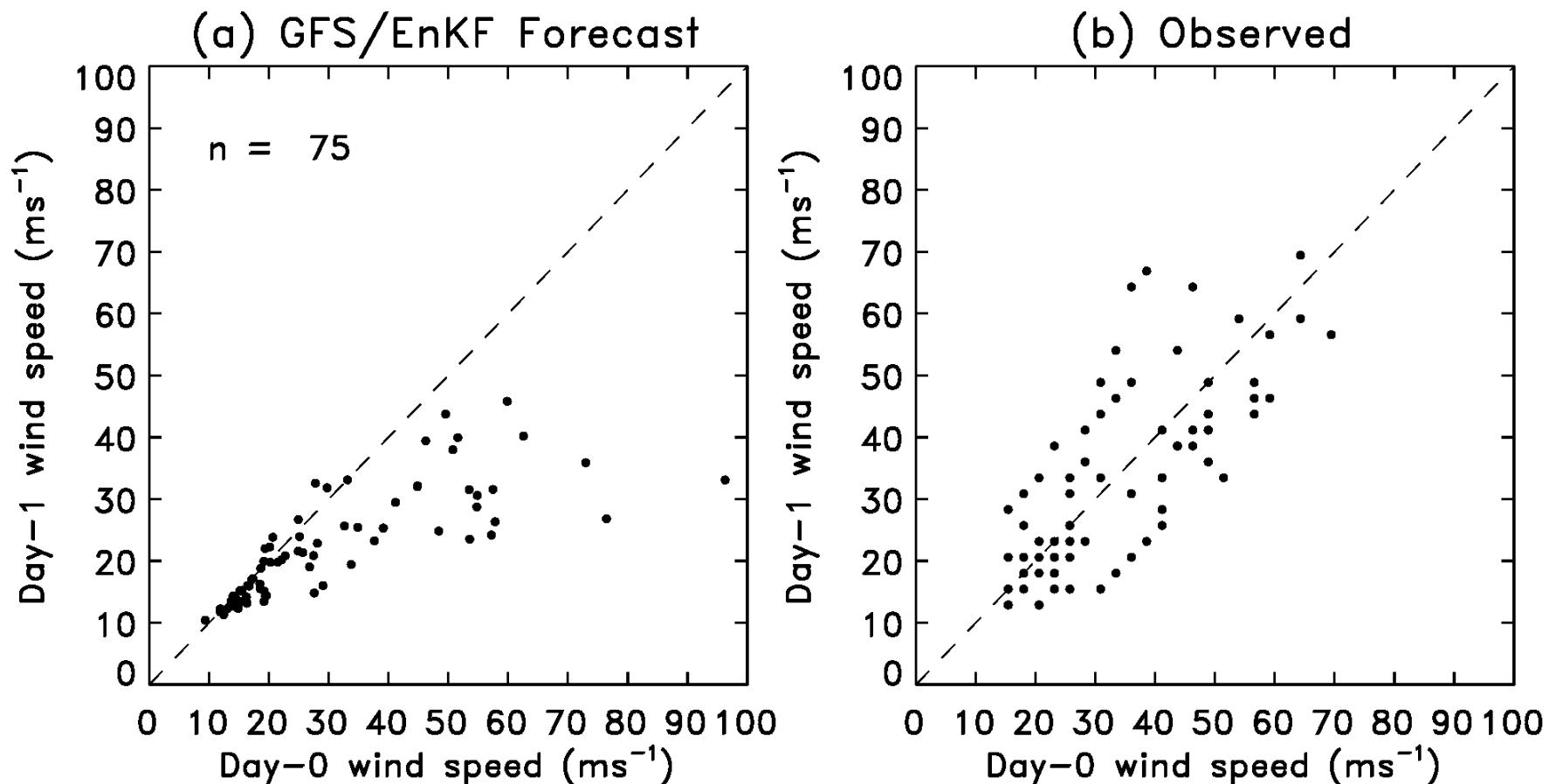


CMC less skillful, but at least their error is consistent with their spread in general.

Lead-dependent bias

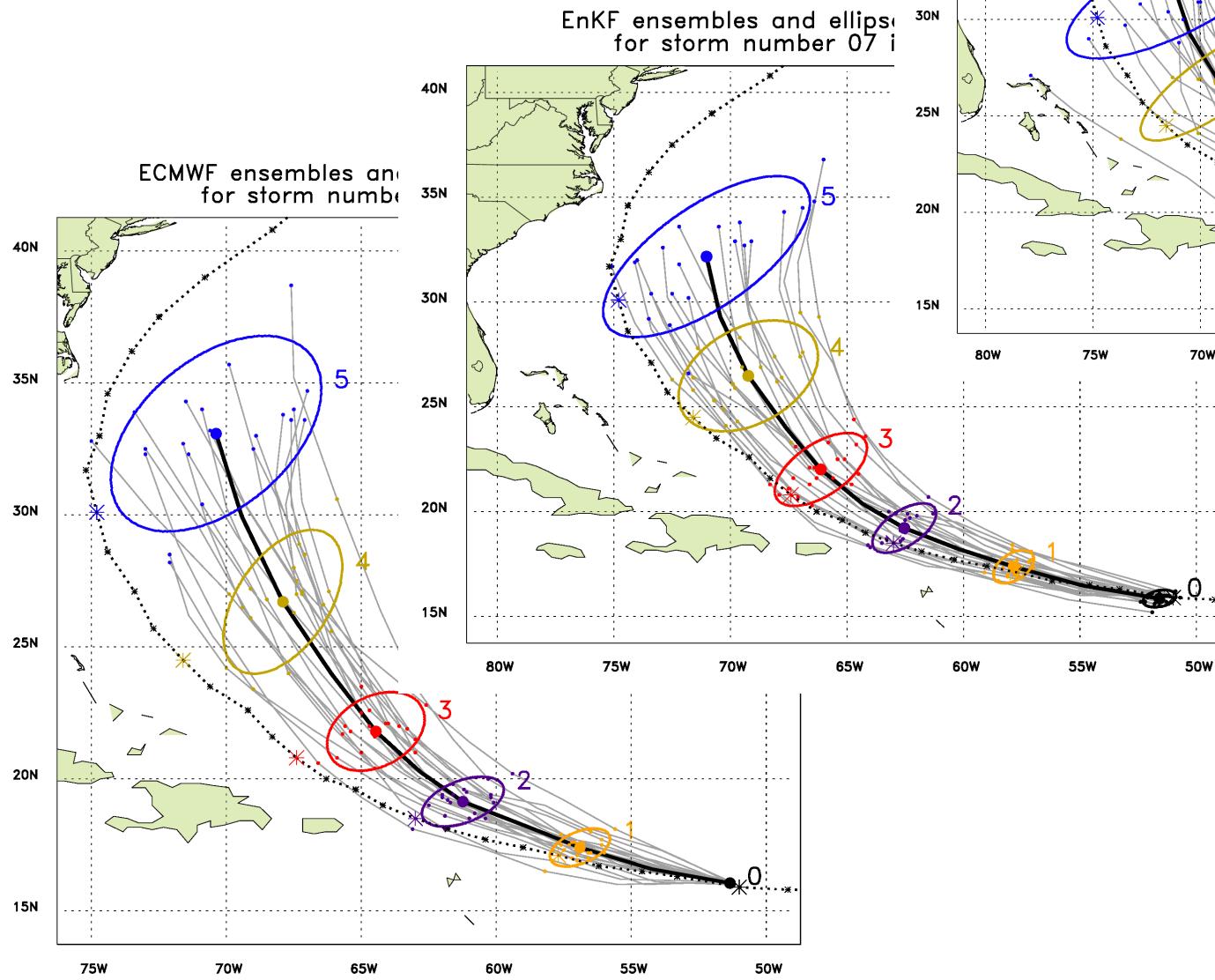


Decrease in intensity with most intense storms early in forecast – same as last year



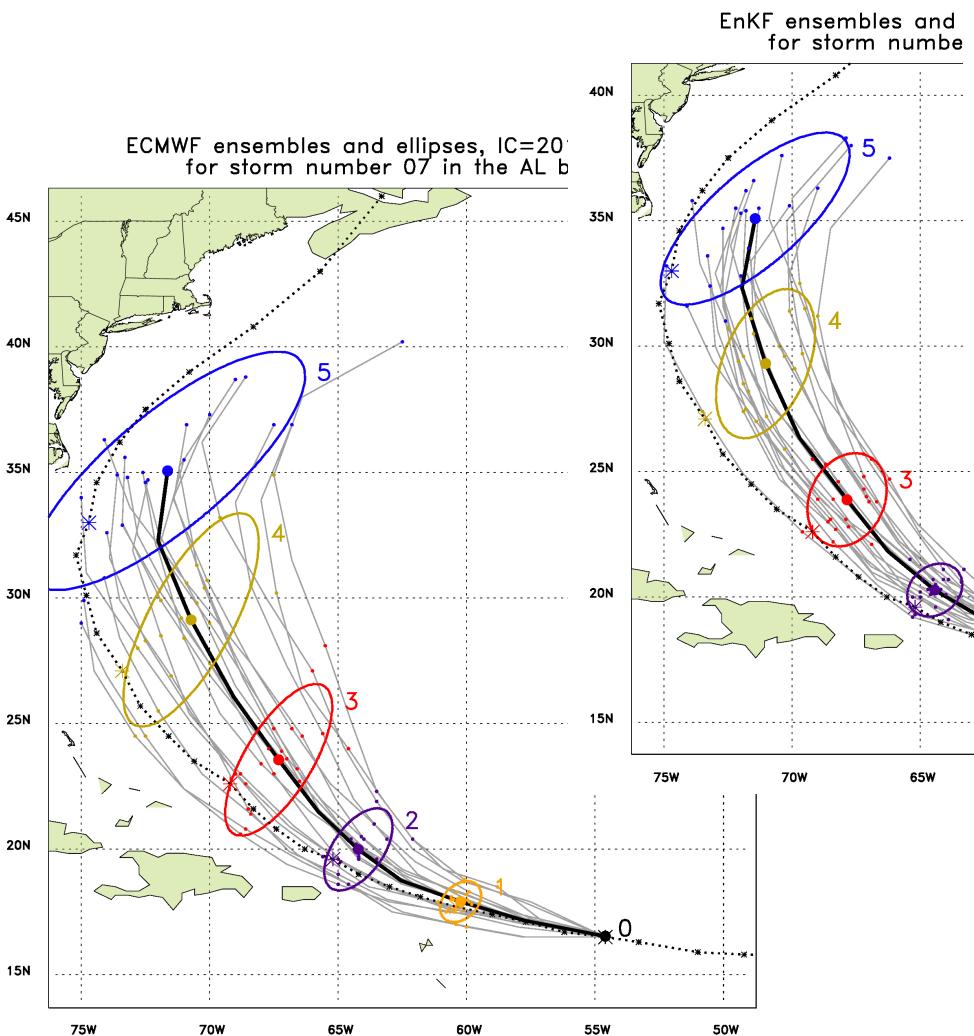
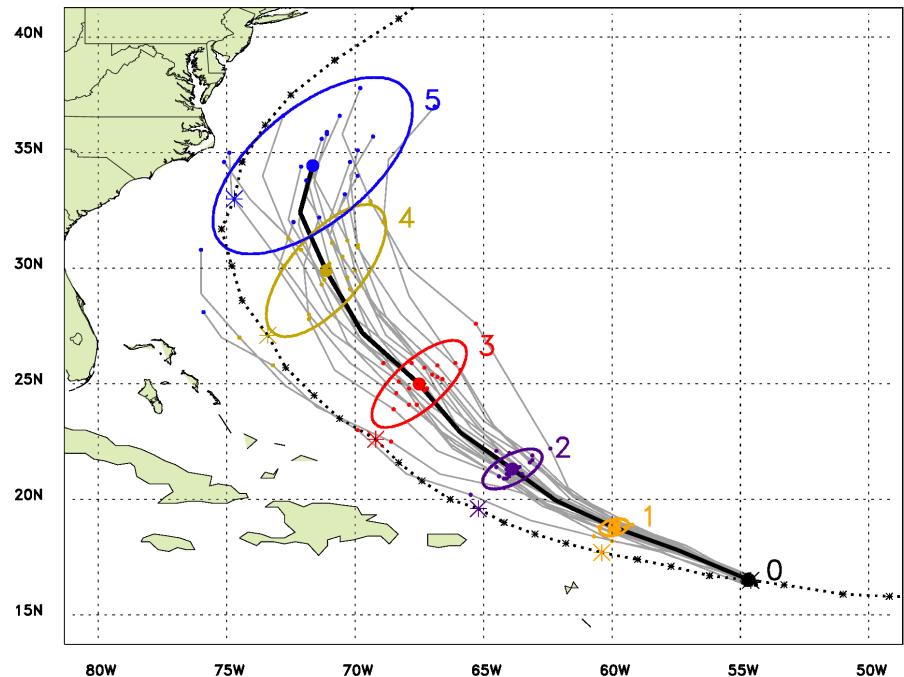
have not made switch yet with this to separate position/intensity assimilation and further tweaks of obs error statistics.

Earl, 2010/08/28/12Z

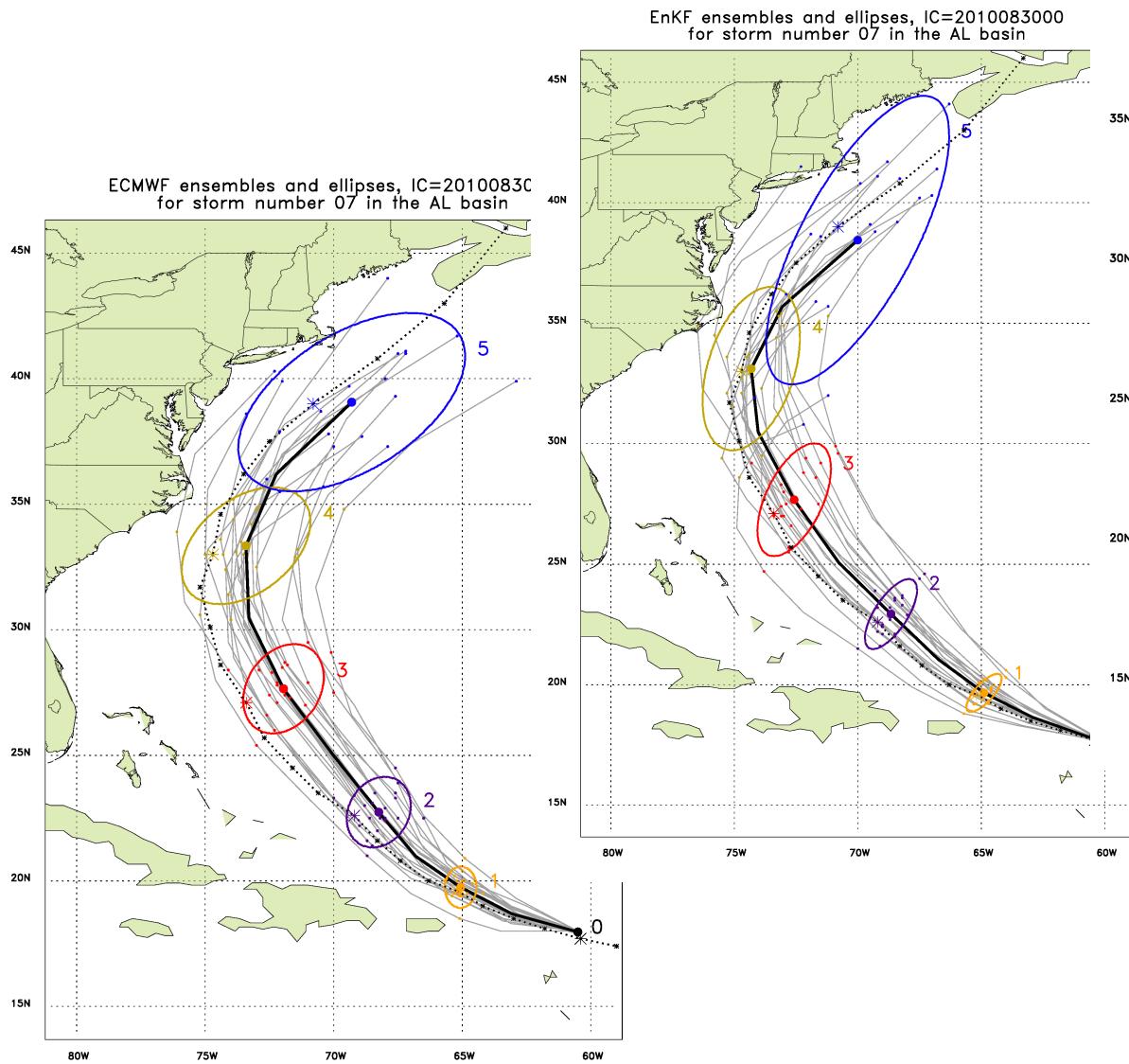


Earl, 2010/08/29/00Z

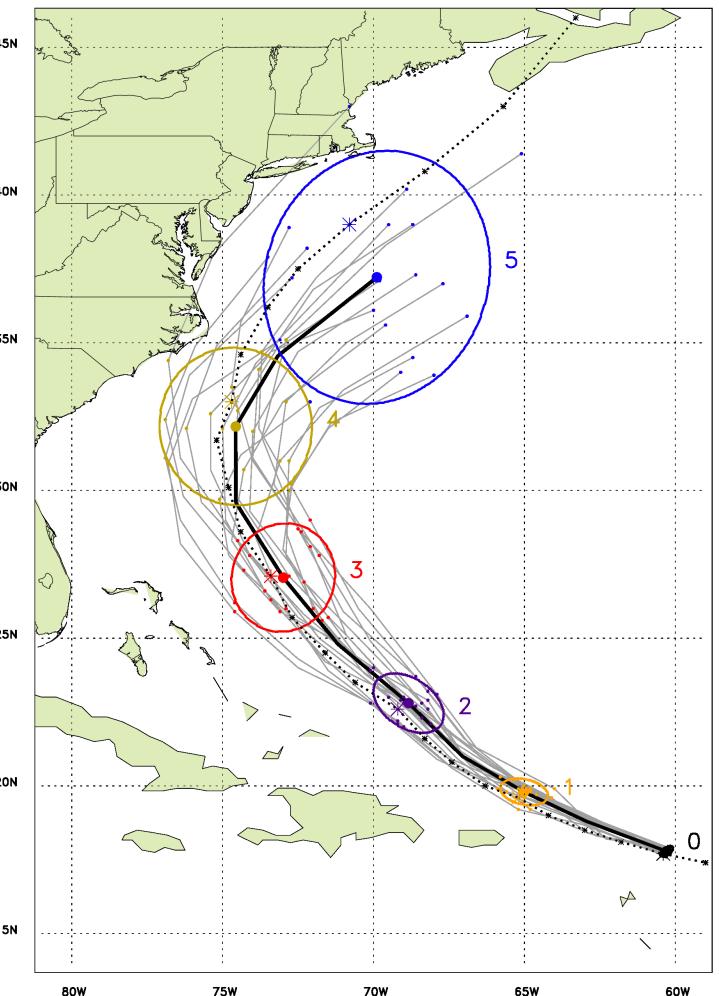
NCEP ensembles and ellipses, IC=2010082900
for storm number 07 in the AL basin



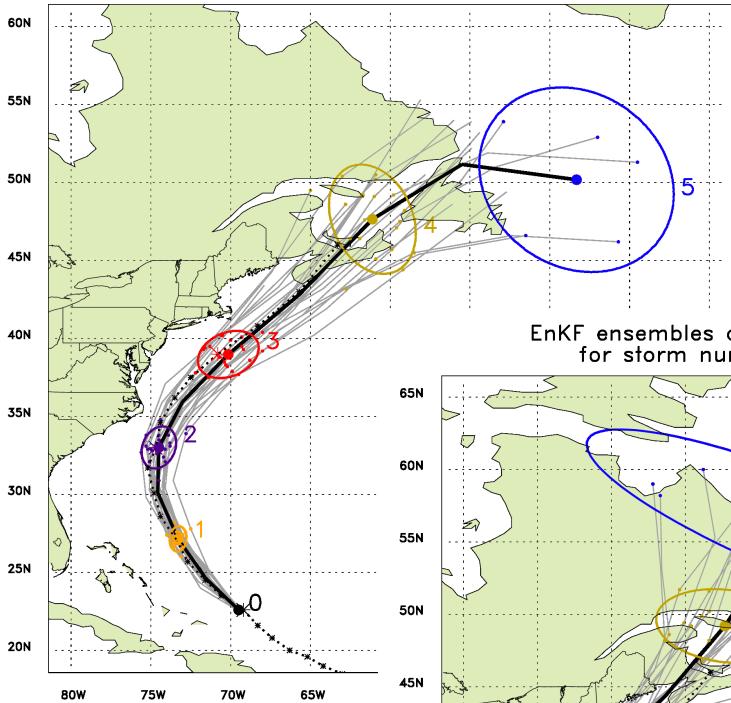
Earl, 2010/08/30/00Z



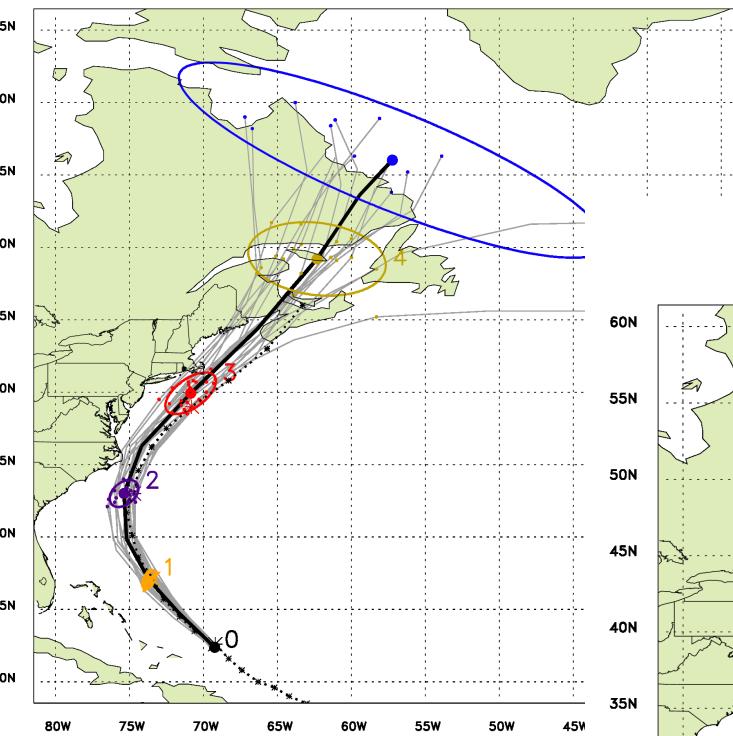
NCEP ensembles and ellipses, IC=2010083000
for storm number 07 in the AL basin



ECMWF ensembles and ellipses, IC=2010090100
for storm number 07 in the AL basin

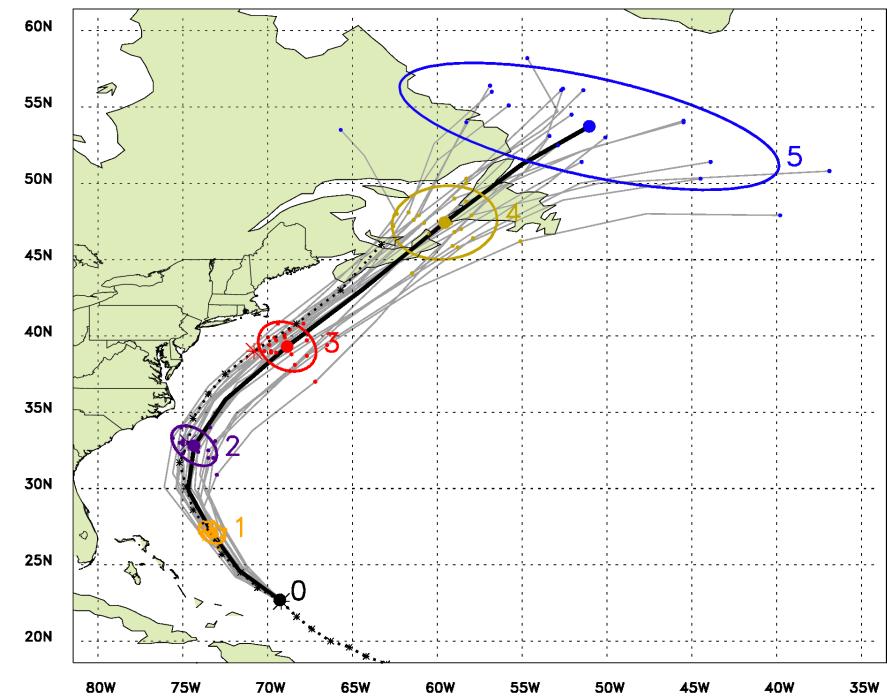


EnKF ensembles and ellipses, IC=2010090100
for storm number 07 in the AL basin



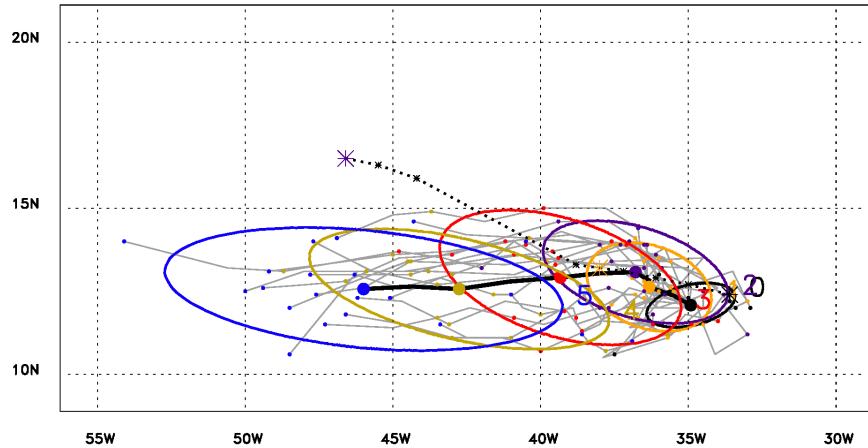
Earl,
2010/09/01/00z

NCEP ensembles and ellipses, IC=2010090100
for storm number 07 in the AL basin

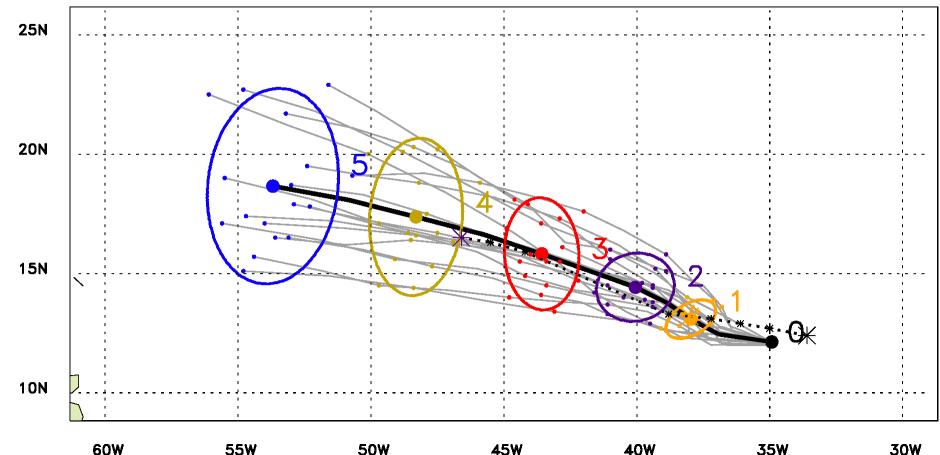


Gaston, 2010/09/01/12Z

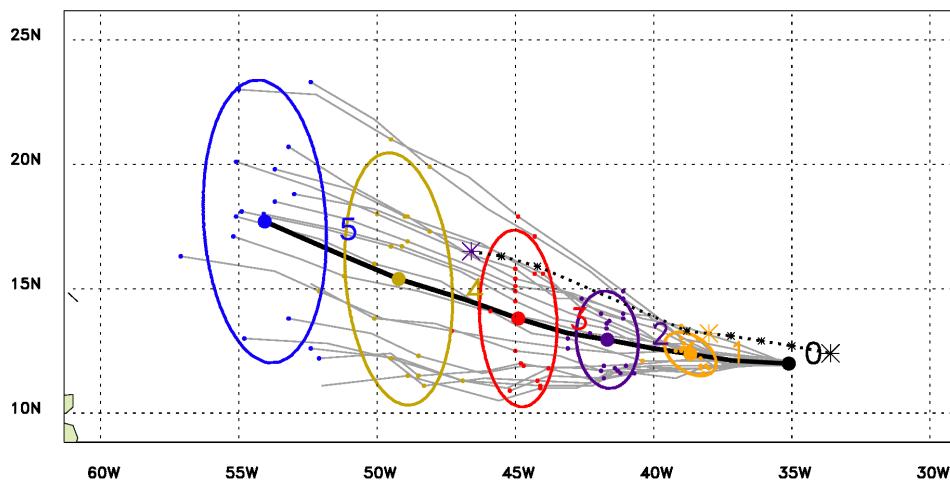
ECMWF ensembles and ellipses, IC=2010090112
for storm number 09 in the AL basin



EnKF ensembles and ellipses, IC=2010090112
for storm number 09 in the AL basin

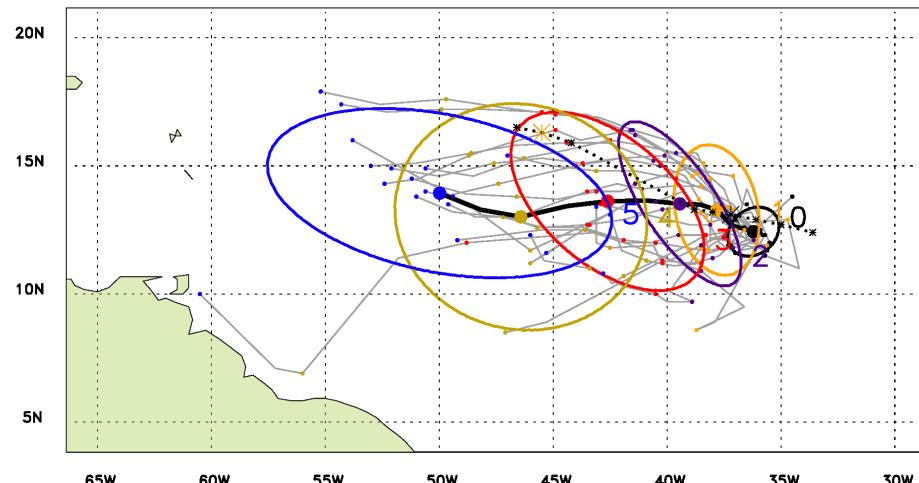


NCEP ensembles and ellipses, IC=2010090112
for storm number 09 in the AL basin

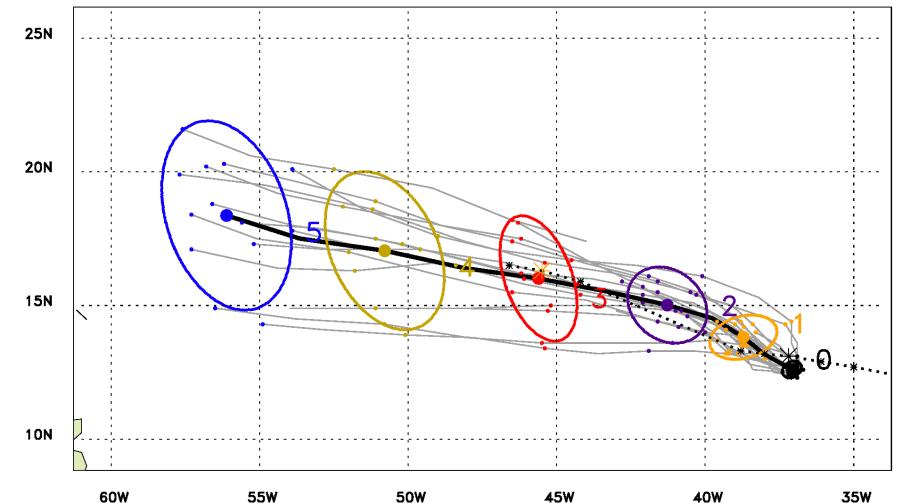


Gaston, 2010/09/02/12Z

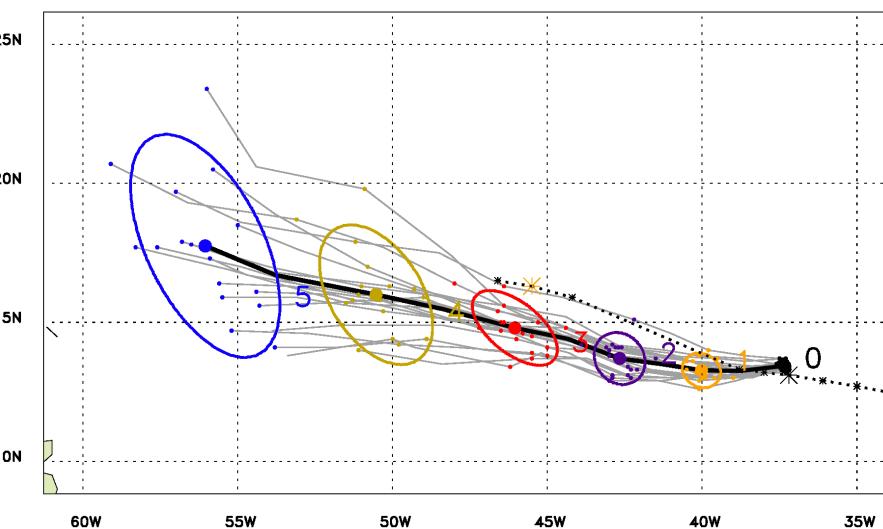
ECMWF ensembles and ellipses, IC=2010090200
for storm number 09 in the AL basin



EnKF ensembles and ellipses, IC=2010090200
for storm number 09 in the AL basin

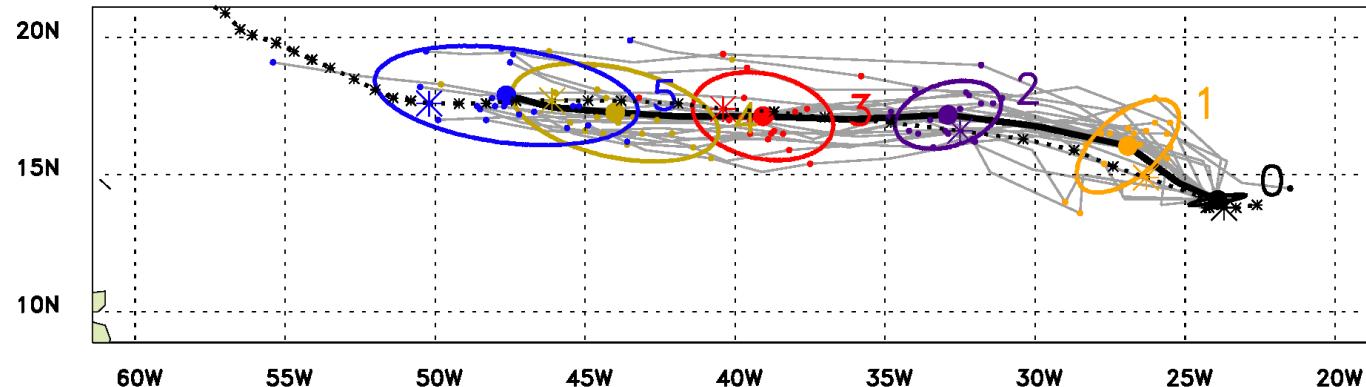


NCEP ensembles and ellipses, IC=2010090200
for storm number 09 in the AL basin

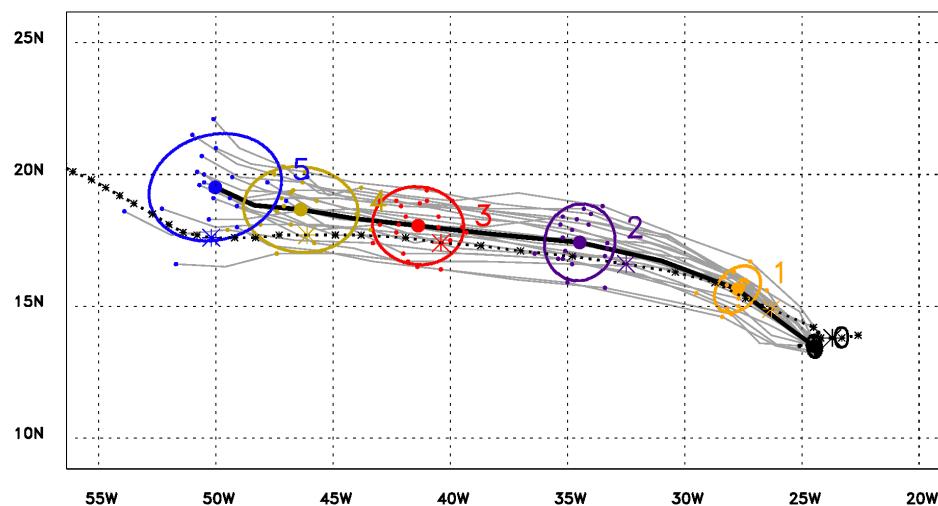


Igor, 2010/09/09/00Z

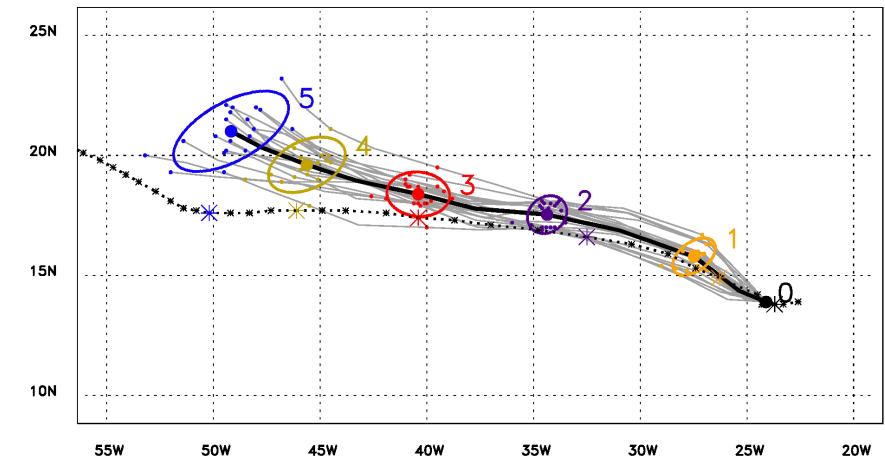
ECMWF ensembles and ellipses, IC=2010090900
for storm number 11 in the AL basin



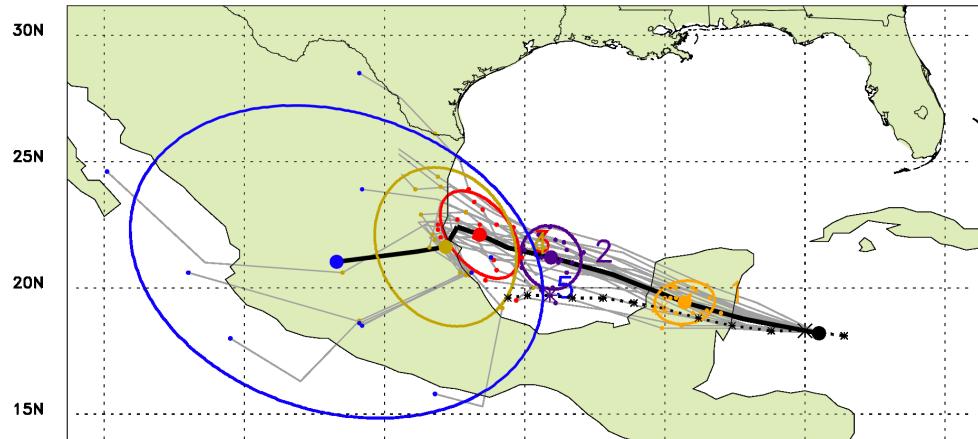
EnKF ensembles and ellipses, IC=2010090900
for storm number 11 in the AL basin



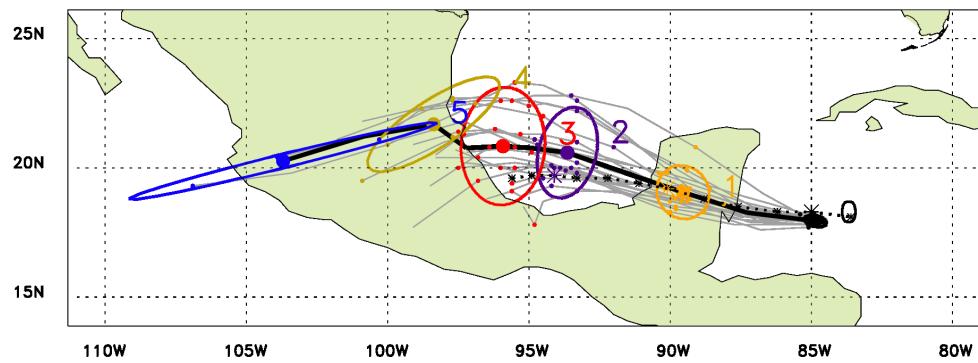
NCEP ensembles and ellipses, IC=2010090900
for storm number 11 in the AL basin



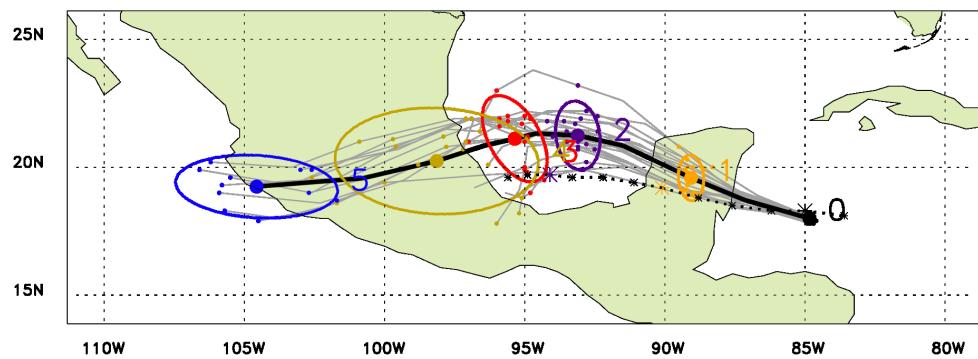
ECMWF ensembles and ellipses, IC=2010091500
for storm number 13 in the AL basin



EnKF ensembles and ellipses, IC=2010091500
for storm number 13 in the AL basin



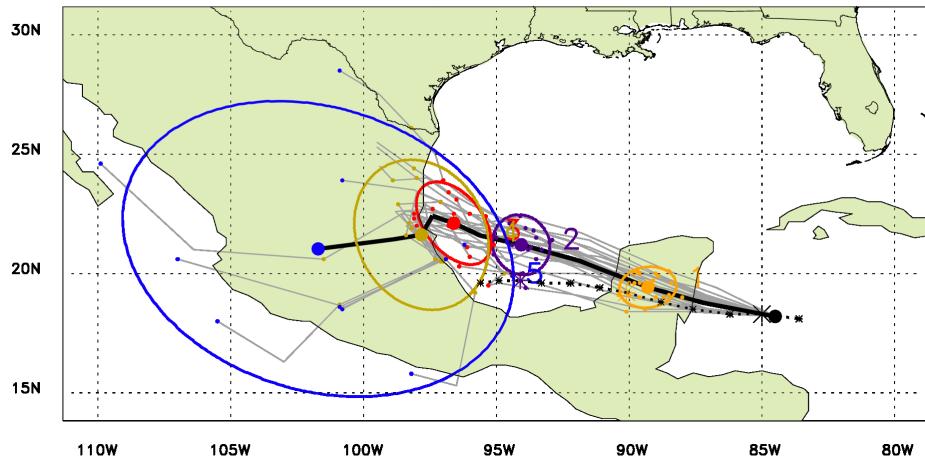
NCEP ensembles and ellipses, IC=2010091500
for storm number 13 in the AL basin



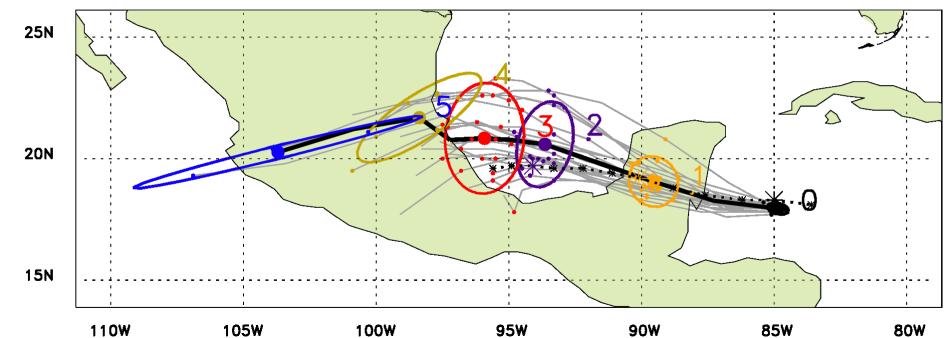
Karl,
2010/09/15/00Z

Karl, 2010/09/16/00Z

ECMWF ensembles and ellipses, IC=2010091500
for storm number 13 in the AL basin



EnKF ensembles and ellipses, IC=2010091500
for storm number 13 in the AL basin



NCEP ensembles and ellipses, IC=2010091500
for storm number 13 in the AL basin

